Self-Contained Self-Rescuer (SCSR) Technology: Capabilities/Challenges

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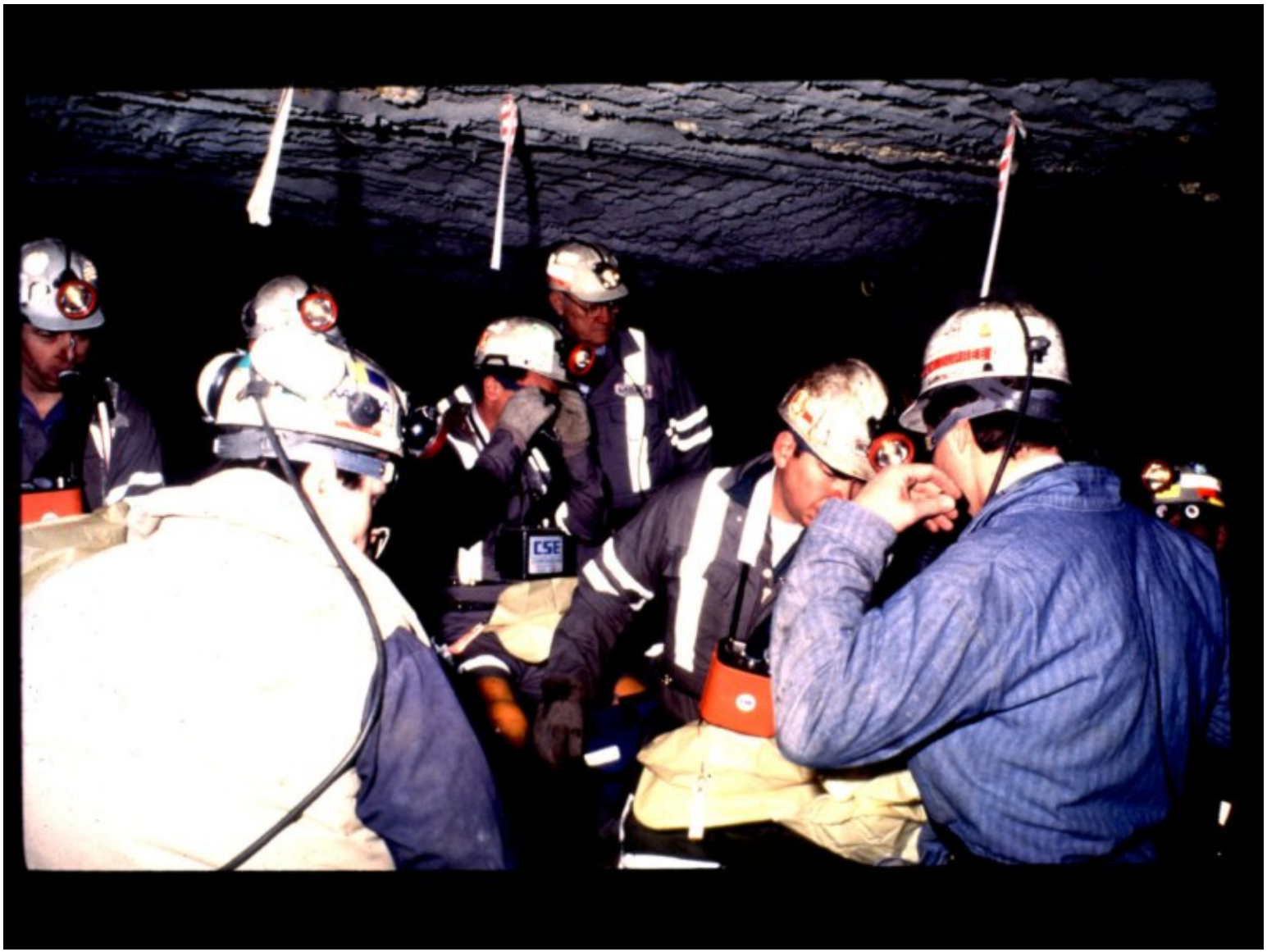
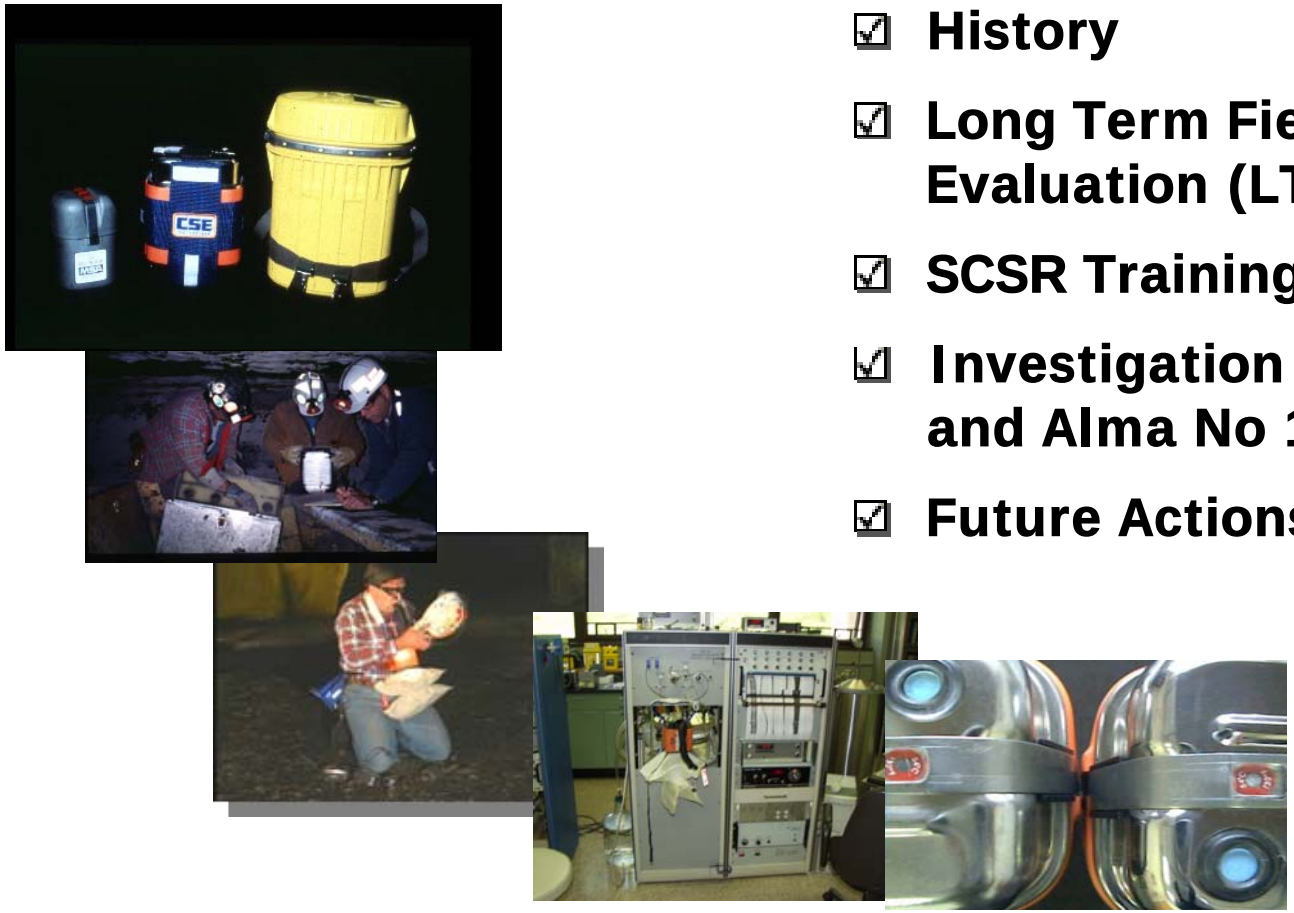

CSE

Topics



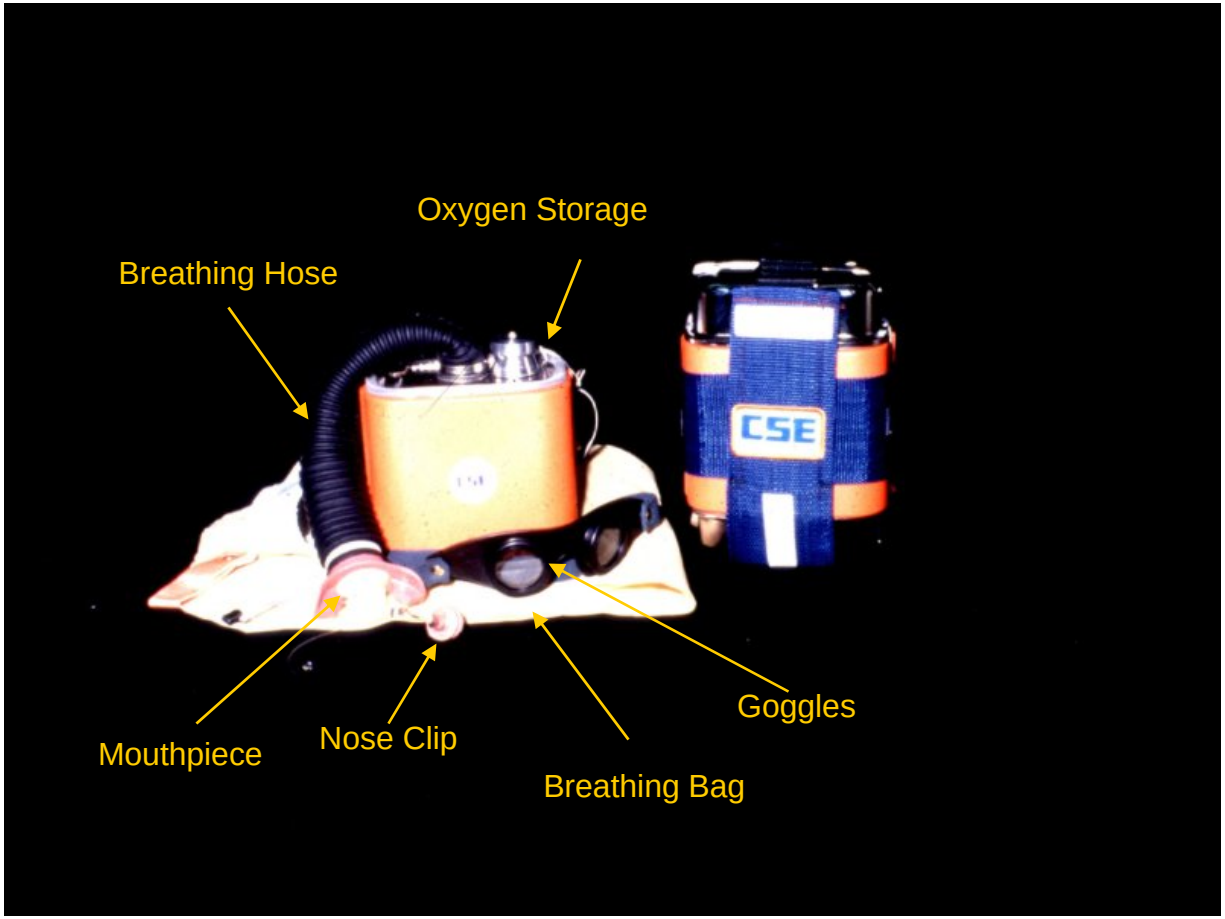
- ☑ History
- ☑ Long Term Field Evaluation (LTFE)
- ☑ SCSR Training
- ☑ Investigation of Sago and Alma No 1 SCSRs
- ☑ Future Actions

SCSR History

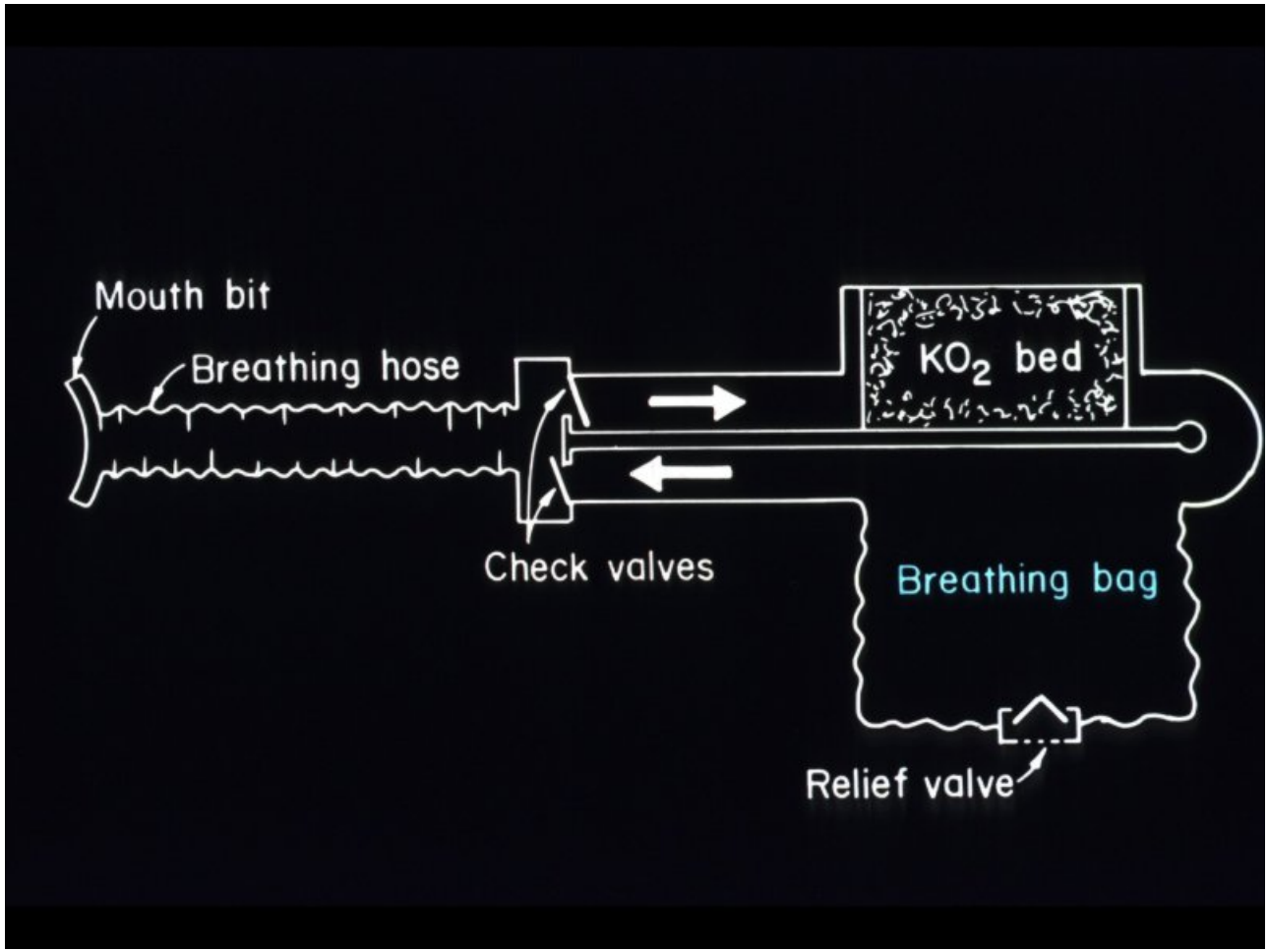
- **Pre-1981 miners rely on FSRs**
- **1981 1st generation SCSRs**
  - Joint MSHA/NIOSH Approval
    - MSHA (30 CFR 75.1714)
    - NIOSH (42 CFR 84)
- **1983 LTFE begins (50 SCSRs/year)**
- **1989 2nd generation SCSRs**
  - Smaller, lighter weight
- **2000 SCSR reliability**
  - MSHA durability study
  - LTFE expands
    - 200 SCSRs/year
    - 100 FSRs/year
- **2005 NTTC SCSR Workshop**

MSHA/NIOSH Approved SCSRs

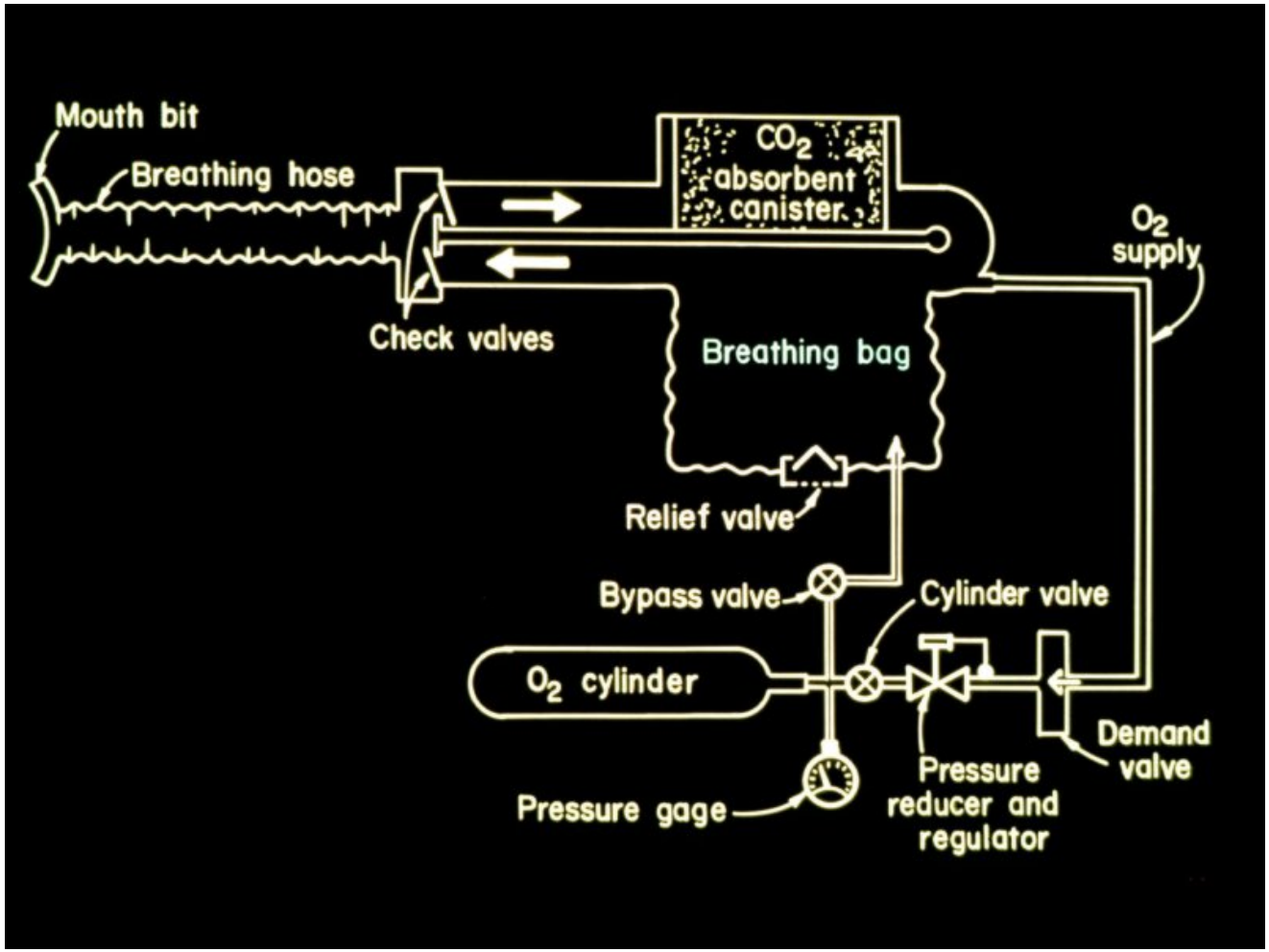
SCSR – As Deployed



Chemical Oxygen SCSR



Compressed Oxygen SCSR



Lessons Learned From The 25 Year History of SCSRs

- **Escape is the primary survival strategy.**
- **Escape means taking a miner on foot and under apparatus from the deepest point of penetration in the mine to safety.**
- **In some cases more than 1 SCSR per miner is needed for escape.**
  - 1 hr SCSR does not mean 1 hr for every miner under every circumstance
  - Actual duration depends upon
    - Miner – body weight , age, physical fitness
    - Difficulty of the escape – distance, escapeway factors
    - Miner's confidence
- **Miner's confidence in SCSRs depends on:**
  - Quality
  - Reliability
  - Training
- **Sometimes, escape is impossible and miners, as a last resort, must emergency shelter and wait for rescue**

Partnerships

- **Stakeholders**
  - BCOA
  - NMA
  - UMWA
  - USWA
  - SCSR manufacturers: CSE, Draeger, MSA, and Ocenco
- **MSHA is co-approver**

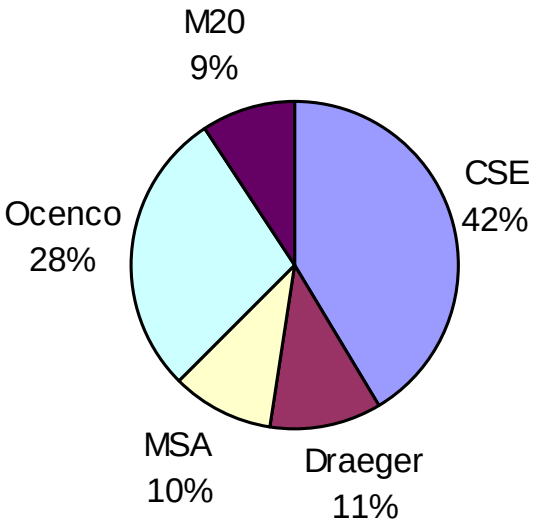
No miner should be forced to rely upon an SCSR that might be unsafe for an escape. Just as important, a miner must have confidence that his SCSR will work in an emergency and have the hands-on knowledge of how to use it. Escape means taking miners on foot and under oxygen from the workplace to a point of safety.

Long-Term Field Evaluation (LTFE)

LTFE Protocols

- **Objective**
  - Track reliability of field deployed SCSRs
- **Method**
  - Sample, replace and inspect
  - Measure life support capability
  - Compare to new SCSRs

In-Mine Collection



	CSE	Draeger	MSA	Ocenco	M20	TOTAL
2003/2004	94	25	23	64	20	**227**
2004/2005	92	22	20	49	15	**198**

Note: SCSRs were collected from 29-mines in 6 MSHA Districts in FY 05.

LTFE Testing

Examples


SR-100

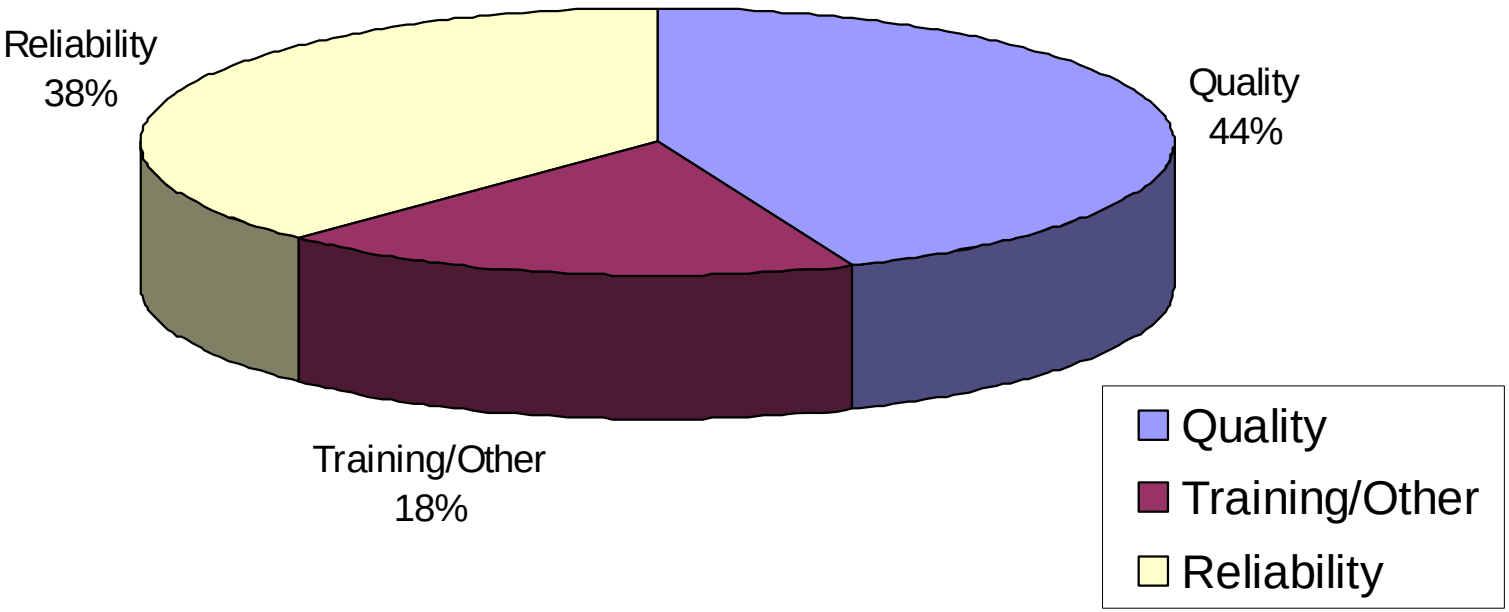

OXY K PLUS


Life Saver 60


EBA 6.5


M-20

Analysis of Problems Investigated since 1992



SCSR Training

Objective

- **To develop, distribute, and evaluate new training which will ensure that a miner knows how to inspect his SCSR and how to use it in the event of an emergency**

SCSR Training Modules

- **Inter-Agency Agreement with MSHA**
  - CSE SR-100
  - Ocenco EBA 6.5 and M-20
  - MSA LifeSaver 60
  - Draeger OXY K Plus and OXY K Plus S
- **Training Module consists of:**
  - Video
  - Computer based training
  - Instructor's Guide
  - Screen Saver
  - Sticker
- **MSHA will distribute to mines**
- **Inclusion in MSHA's Professional Miner Certification Program**

Accomplishments

- **CSE SR-100**
  - Completed the entire training module (video, computer based training CD, instructor's guide, screen saver and sticker) for CSE's SR-100.
  - SR-100 training module has been sent to over 500 mines which use this apparatus.
- **Ocenco's EBA 6.5 and M-20**
  - Completed entire training module.
- **Draeger OXY K Plus/Plus S**
  - Training video completed and finalizing computer based training.
- **MSA Lifesaver 60**
  - Finalizing video.
  - Started production of computer base training.
- ***Training materials are being modified to emphasize multiple donning***

Investigation of SCSRs Recovered from the Sago Mine Disaster and the Alma No. 1 Mine Fire

Background

- The CSE SR-100 is an MSHA NIOSH approved 1-hr SCSR.
- The SR-100 was deployed at both Sago Mine and Alma No. 1 Mine
- These apparatus are considered by MSHA as evidence in their investigation.
- MSHA and NIOSH will conduct a joint investigation of the SCSR's used in the Sago mine disaster.
- The objectives are:
  - To inspect and catalog the condition of the apparatus, as recovered from the mine.
  - To evaluate the life support performance of the apparatus

Protocol

- **Inspection**
  - Conduct a visual inspection according to manufacturer's instructions
  - Assess condition of breathing hose and bag, as well as other system components
  - Document inspections with a visual record
- **Life Support**
  - Unopened units: Performance test on Breathing and Metabolic Simulator (BMS)
  - Opened units: Attempt to restart and measure residual life support capacity on the BMS.
  - Assess condition of the chemical bed.
  - Document life support assessments with a visual record

Timeline

- **Draft protocol submitted for review**
- **MSHA will maintain the chain of custody while the units are undergoing investigation.**
- **The time frame for testing will be governed by findings, and may span several weeks.**

Future Actions: Improvements, New Technology

- **Improvements**
  - Function
  - Performance
- **New SCSR Technology**
  - Hybrid Self-Rescuer (HSR)
  - Dockable SCSR (D-SCSR)

Proposed Improvements

ABMS testing

Ruggedness/reliability

Safety requirements

NDT

Self-reporting

Registration

Likely Impact On Stakeholders

- **Manufacturers**
  - Only performance or functional requirements will be stipulated, so there will be no regulatory barriers to technological innovation.
  - Apparatus will be rated according to useable oxygen capacity, measured by a constant work rate ABMS test, rather than duration.
- **Users**
  - SCSRs will be the simplest designs which meet the requirements, leading to improved ease and confidence of use as well as greater reliability.
- **Government**
  - There will be effective mechanisms for early discovery and reaction to field complaints.

New Technology

- **Hybrid Self Rescuer (HSR)**
  - A combination of an SCSR which transforms or switches over to an air purifying respirator.
  - Prototypes of this type of respirator were discussed at NIOSH/MSHA sponsored Self-Contained Self-Rescuers Breathing System Workshops (June and December 2005) held in conjunctions with the National Technology Transfer Center (NTTC) of Wheeling Jesuit University.
- **Dockable (piggyback) SCSR (D-SCSR)**
  - Additional units would be connected to the initial SCSR thus eliminating the need to make multiple donnings and would have similar benefits as a hybrid system.
  - This type of unit is allowable under interpretations of current MSHA regulations (30 CFR Part 75.1714) which permits a 10/60 SCSR